MULTIMEDIA UNIVERSITY

STUDENT ID NO

MULTIMEDIA UNIVERSITY

FINAL EXAMINATION

TRIMESTER 3, 2016/2017

BMF1014 – MATHEMATICS FOR FINANCE

(All sections / Groups)

30 MAY 2017
9.00 a.m. – 11.00 a.m.
(2 Hours)

INSTRUCTIONS TO STUDENT

1. This question paper consists of 5 pages excluding the cover page.
2. Attempt ALL FOUR questions.
3. Write your answers in the Answer Booklet provided.
4. Mathematical formula is attached at the end of this question paper.

Question 1 (25 marks)

(a) Find an equation of the line passing through (2, 3) and is parallel to $y = -4x + 1$. Then, sketch the line.

(9 marks)

(b) Hot Oven is one of the supplier for children's birthday cakes. The fixed monthly cost is RM 8,000. If each cake costs RM 30 and sells for RM 70, find:

(i) the cost function. (3 marks)

(ii) the revenue function. (3 marks)

(iii) the profit function. (4 marks)

(c) Find the market equilibrium point for the following demand and supply functions where p denotes the price of the product and q is the quantity demanded and supplied.

$$Demand = p = -q + 24$$
$$Supply = p = 2q + 18$$

(6 marks)

Question 2 (25 marks)

Consider the following system of equations,

$$x + 2y + 4z = 1$$
$$2x + 3z = 8$$
$$x + y + 2z = 4$$

(a) Write the system of equation above in matrix equation, $\mathbf{AX} = \mathbf{B}$. (3 marks)

(b) Find the determinant, the cofactor and the inverse of matrix **A**. (17 marks)

(c) Solve the system of equations above using the inverse method. (5 marks)

Continued...

Question 3 (25 marks)

(a) A bank account pay 5.3% interest compounded monthly. How much must be deposited now so that the account contains exactly RM 12,000 at the end of 2.5 years?

(4 marks)

(b) Soylent Green Landscaping wants to build a RM 250,000 greenhouse in 3 years. The company sets up a sinking fund with payments made quarterly. Find the payment into this fund if the money earns 5% compounded quarterly.

(5 marks)

(c) Danny Rand deposits $130 each month into a savings account that pays 5.5% compounded monthly. How much interest will he earn after 8 years?

(7 marks)

(d) The Meachums is planning to purchase a property for their business purposes. They can afford to make a down payment of $ 3,000 and semiannual payments of $ 250 for seven years. The interest rate is at 8% compounded semiannually.

(i) What is the cash price of the property that the Meachums can afford?

(7 marks)

(ii) Calculate the total interest charged over seven years if the Meachums bought the property.

(2 marks)

Continued...

Question 4 (25 marks)

(a) Suppose a revenue function for a company selling hardware products is given as follows where x is the quantity of products sold.

$$R(x)=\frac{15x^2}{2x^2+7x-3}$$

Find the marginal revenue at $x=5$. (7 marks)

(b) Consider the following function,

$$f(x,y)=5x^2-3y^2-30x+7y+4xy$$

(i) Find the critical point at which the function may be optimized. (8 marks)

(ii) Show that the critical point found above is a saddle point. (5 marks)

(c) Consider the expression: $8x(2x^2+3)^3$.

(i) If $u=2x^2+3$, find du/dx. (1 mark)

(ii) Evaluate $\int 8x(2x^2+3)^3\,dx$ using the substitution method. (4 marks)

End of Question Page.

Subject Code: BMF1014
Subject Name: Mathematics for Finance

Summary of Principal Formulas and Terms

1. Quadratic Formula

The solution of the equation: $ax^2 + bx + c = 0$ where $a \neq 0$

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

2. Simple Interest

(i) Interest, $I = Prt$ (P = principal, r = interest rate, t = number of years)
(ii) Accumulated amount, $A = P\,(1 + rt)$

3. Compound Interest

(i) Accumulated amount, $A = P(1+i)^n$, where $i = \frac{r}{m}$, and $n = mt$
(m = number of conversion periods per year)

(ii) Present value for compound interest, $P = A(1+i)^{-n}$

4. Effective Rate of Interest

$$r_{eff} = \left[1 + \frac{r}{m}\right]^m - 1$$

5. Future Value of an Annuity

$$S = R\left[\frac{(1+i)^n - 1}{i}\right]$$ (S = future value of ordinary annuity of n payments of R dollars periodic payment)

6. Present Value of an Annuity

$$P = R\left[\frac{1-(1+i)^{-n}}{i}\right]$$ (P = present value of ordinary annuity of n payments of R dollars periodic payment)

7. Amortization Formula

$$R = \frac{Pi}{1-(1+i)^{-n}}$$ (R = periodic payment on a loan of P dollars to be amortized over n periods)

8. Sinking Fund Formula

$$R = \frac{Si}{(1+i)^n - 1}$$ (R = periodic payment required to accumulate S dollars over n periods)

9. Basic Rules of Differentiation

(a) Derivative of a constant: If $f(x)$ is a constant, then $f'(x)=0$

(b) Power rule : If $f(x)$ is x^n, then $f'(x)=nx^{n-1}$

(c) Constant multiple rule: $\frac{d}{dx}[cf(x)]=cf'(x)$ (c is a constant)

(d) Sum rule: $\frac{d}{dx}[f(x)\pm g(x)]=f'(x)\pm g'(x)$

(e) Product rule: If $f(x)=u(x)\cdot v(x)$, then $f'(x)=u(x)v'(x)+v(x)u'(x)$

(f) Quotient rule: $f'(x)=\frac{d}{dx}\left[\frac{u(x)}{v(x)}\right]=\frac{v(x)u'(x)-u(x)v'(x)}{[V(x)]^2}$

(g) Chain rule: $\frac{d}{dx}\{g[f(x)]\}=g'[f(x)]f'(x)$

(h) General power rule: $\frac{d}{dx}[f(x)]^n=n[f(x)]^{n-1}f'(x)$

(i) Exponential function: $\frac{d}{dx}(e^u)=e^u[u'(x)]$

(j) Logarithmic function: $\frac{d}{dx}(\ln u)=\left(\frac{1}{u}\right)[u'(x)]$

10. Basic Rules of Integration

(a) Indefinite integral of a constant: $\int k\ du=ku+C$

(b) Power rule: $\int u^n\,du=\frac{u^{n+1}}{n+1}+C$

(c) Constant multiple rule: $\int kf(u)\ du=k\int f(u)\ du$ where k is a constant

(d) Sum rule: $\int[f(u)\pm g(u)]\ du=\int f(u)du+\int g(u)du$

(e) Exponential function: $\int e^u\,du=e^u+C$

(f) Logarithmic function: $\int\left(\frac{1}{u}\right)\ du=\ln u+C$

11. Determining Relative Extremas

$D(x,y)=f_{xx}f_{yy}-(f_{xy})^2$

If D > 0 and f_{xx} > 0, relative minimum point occurs at (x, y).
If D > 0 and f_{xx} < 0, relative maximum point occurs at (x, y).
If D < 0, (x, y) is neither maximum nor minimum.
If D = 0, the test is inconclusive.